Hole's Human Anatomy and Physiology

Twelfth Edition

Shier w Butler w Lewis

Chapter 6 Integumentary System

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6.1: Introduction

- **Two or more kinds of tissues grouped together and performing specialized functions constitutes an organ.**

- **The skin and its various structures make up the integumentary system.**

6.2: Skin and Its Tissues

- **Composed of several tissue types**
- **Maintains homeostasis**
- **Protective covering**
- **Retards water loss**
- **Regulates body temperature**
- **Houses sensory receptors**
- **Contains immune system cells**
- **Synthesizes chemicals**
- **Excretes small amounts of wastes**

Skin Cells

- **Help produce Vitamin D needed for normal bone and tooth development**
- **Some cells (keratinocytes) produce substances that simulate development of some white blood cells**

Layers of Skin (3)

- **Epidermis**
- **Dermis**
- **Subcutaneous layer**
  - **Aka hypodermis**
  - **Beneath dermis**
  - **Some also call it the**

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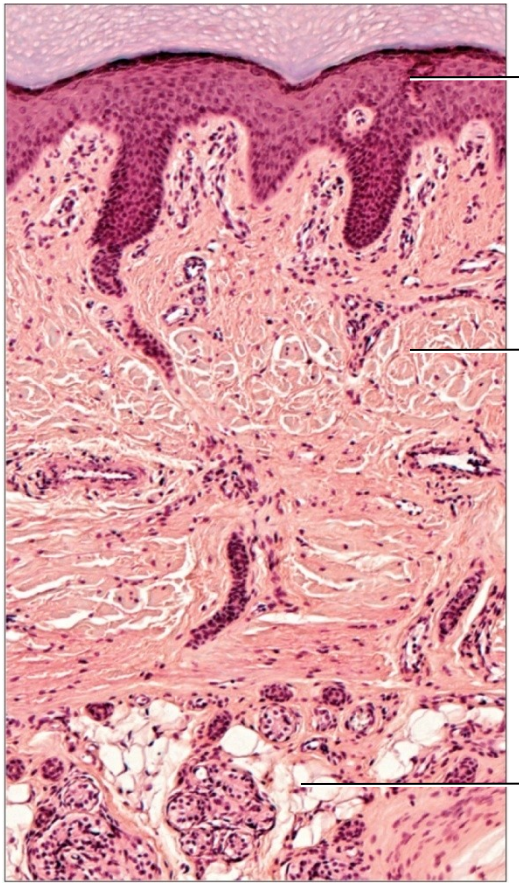

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Epidermis

- Lacks blood vessels
  - Keratinized
- Thickest on palms and soles (0.8-1.4mm)
  - Melanocytes provide some protection
- Rests on basement membrane
- Stratified squamous epithelia

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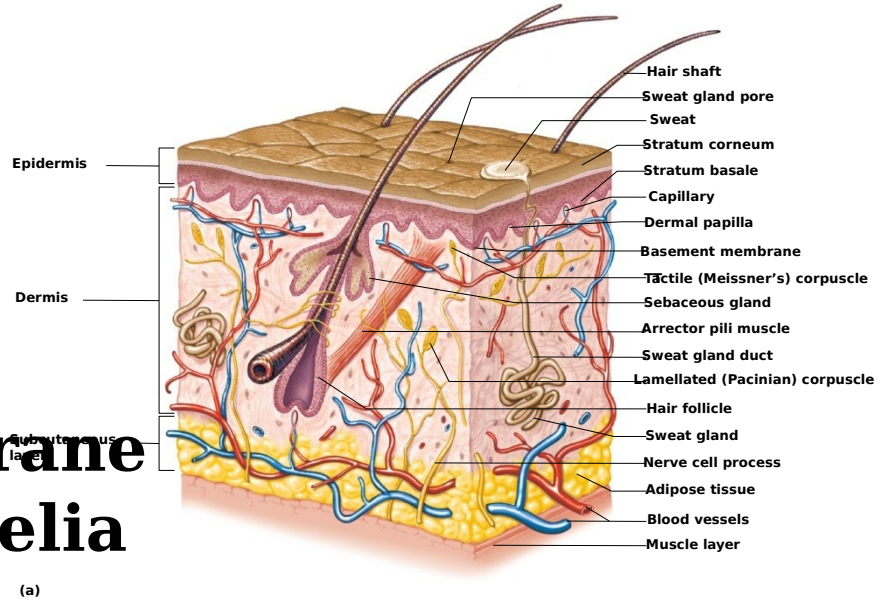

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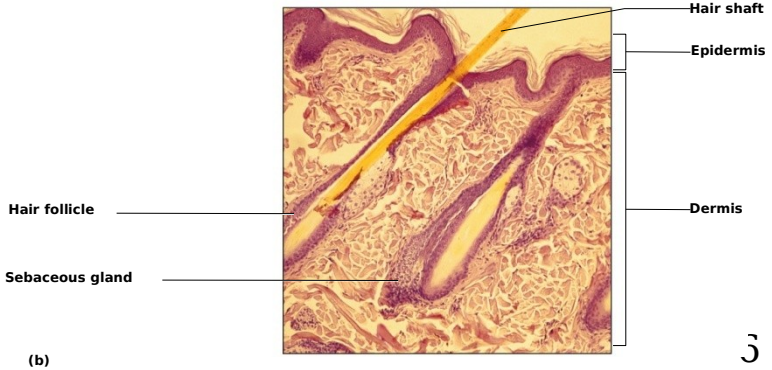

(b)

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Epidermis

ere are five (5) layers of the epidermis:

- **Stratum corneum**
- **Stratum lucidum**
- **Stratum granulosum**
- **Stratum spinosum**
- **Stratum basale**

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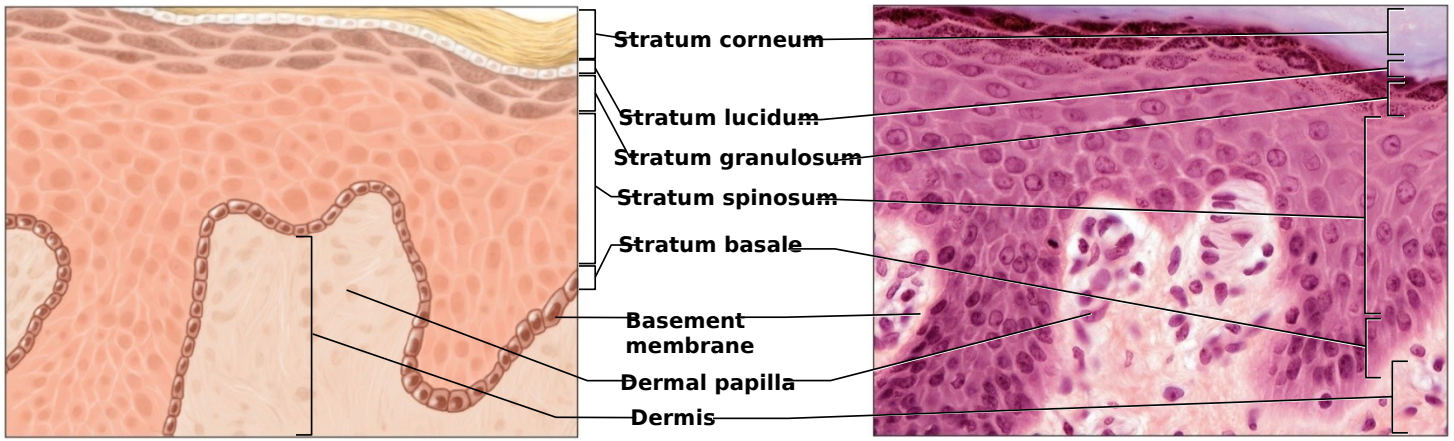

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Epidermis

- Heredity and environment determine skin color
- Genetic Factors
  - Varying amounts of melanin
  - Varying size of melanin granules
  - Albinos lack melanin
- Physiological Factors
  - Dilation of dermal blood vessels
  - Constriction of dermal blood vessels
  - Accumulation of carotene
  - Jaundice
- Environmental Factors
  - Sunlight
  - UV light from sunlamps
  - X-rays
  - Darkens melanin

Dermis

- On average 1.0-2.0mm thick
- Contains dermal papillae
  - Binds epidermis to underlying tissues
- regular dense connective tissu
  - Muscle cells
- Nerve cell processes
- pecialized sensory receptors
  - Blood vessels
  - Hair follicles
- Glands

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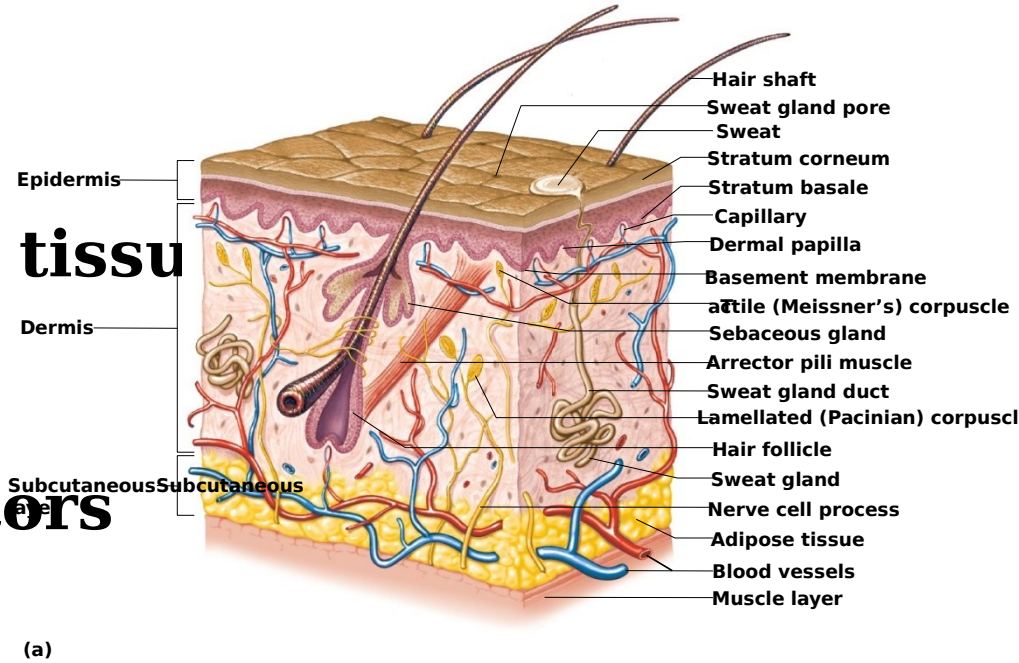

(a)

Dermis

There are actually two (2) layers to the dermis:

- **Papillary layer**
  - **Thin**
  - **Superficial**
  - **Dermal papillae here**
- **Reticular layer**
  - **80% of dermis**
  - **Cleavage, tension or Langer's lines are here**

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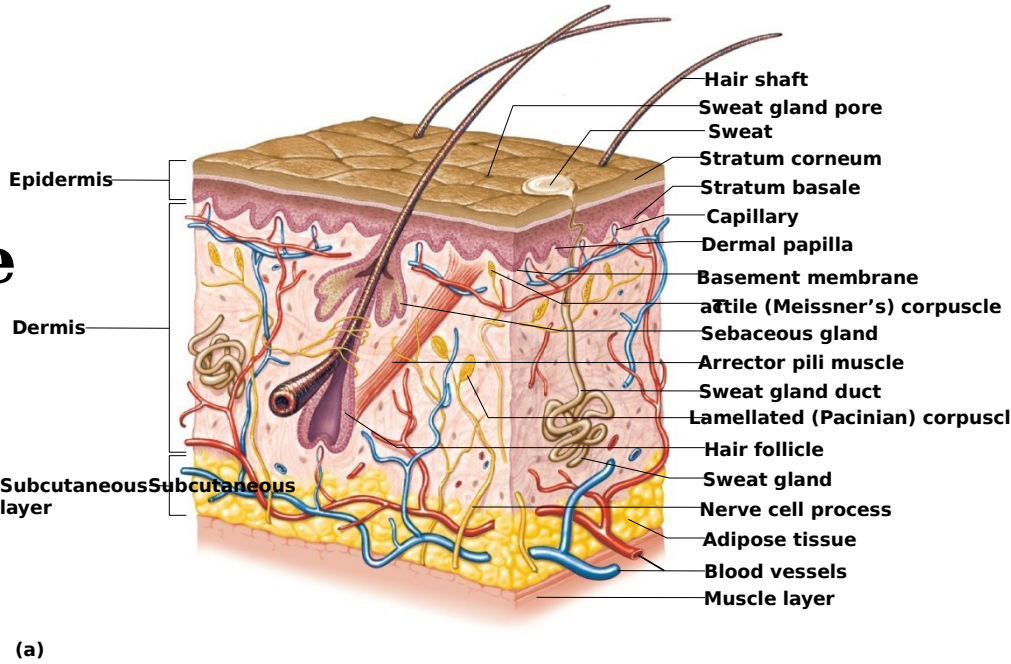

Subcutaneous Layer

- Aka hypodermis
  - Loose connective tissue and…
  - Adipose tissue are present
- Insulates
  - Major blood vessels present

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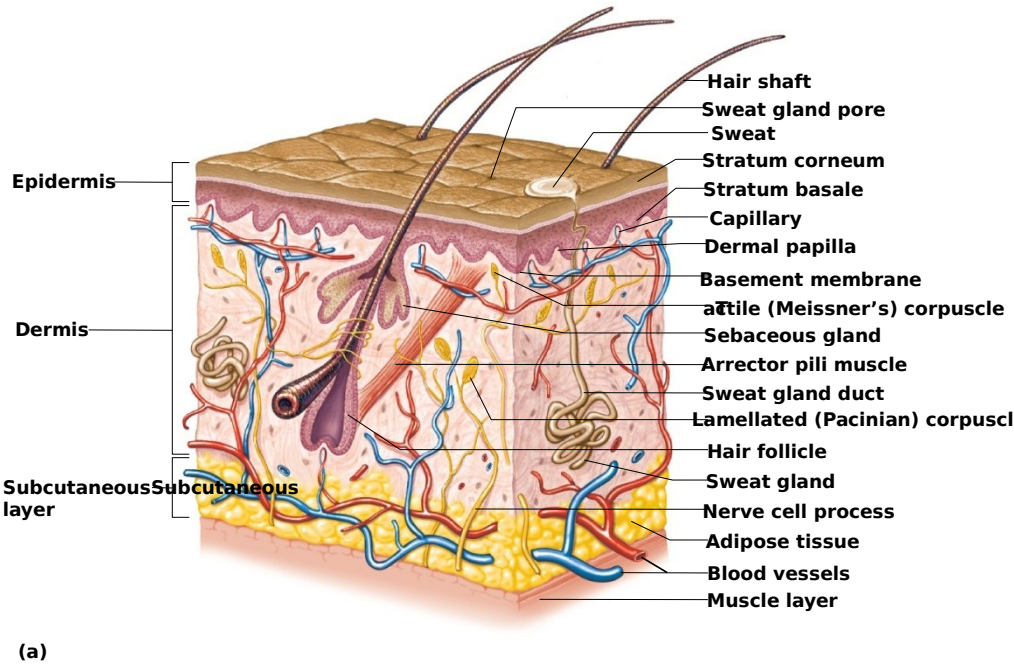

(a)

6.3: Accessory Structures of the Skin

- Accessory structures of the skin originate from the epidermis and include:
  - Hair follicles
  - Nails
  - Skin glands

Hair Follicles

- Epidermal cells
- Tube-like depression
- Extends into dermis
- Three (3) parts:
  - Hair root
    - Hair shaft
    - Hair papilla
- Dead epidermal cells
  - Melanin
- Arrector pili muscle

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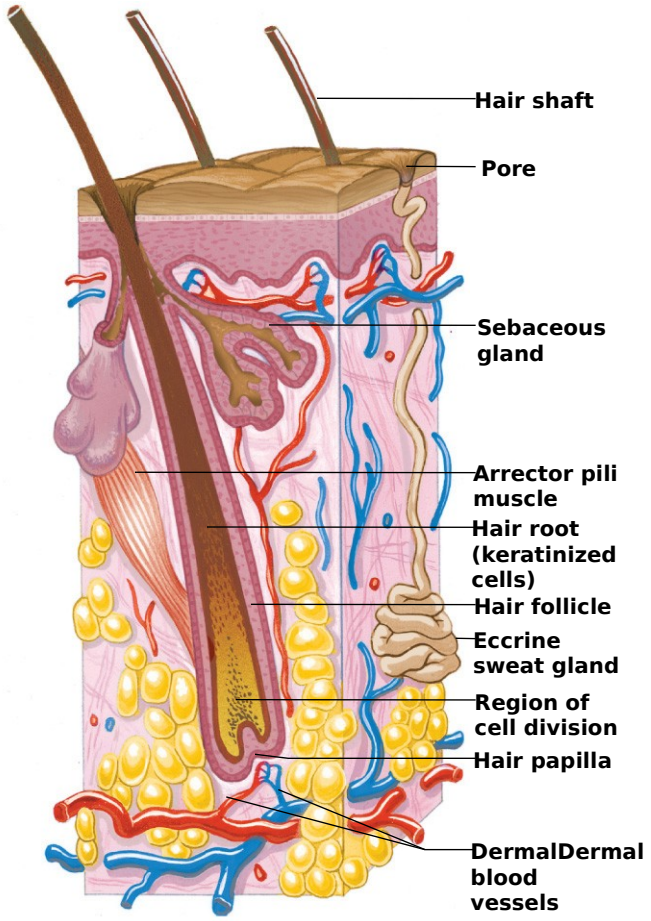

Nails

- **Protective coverings**
- **Three (3) parts:**
  - **Nail plate**
    - **Nail bed**
    - **Lunula**

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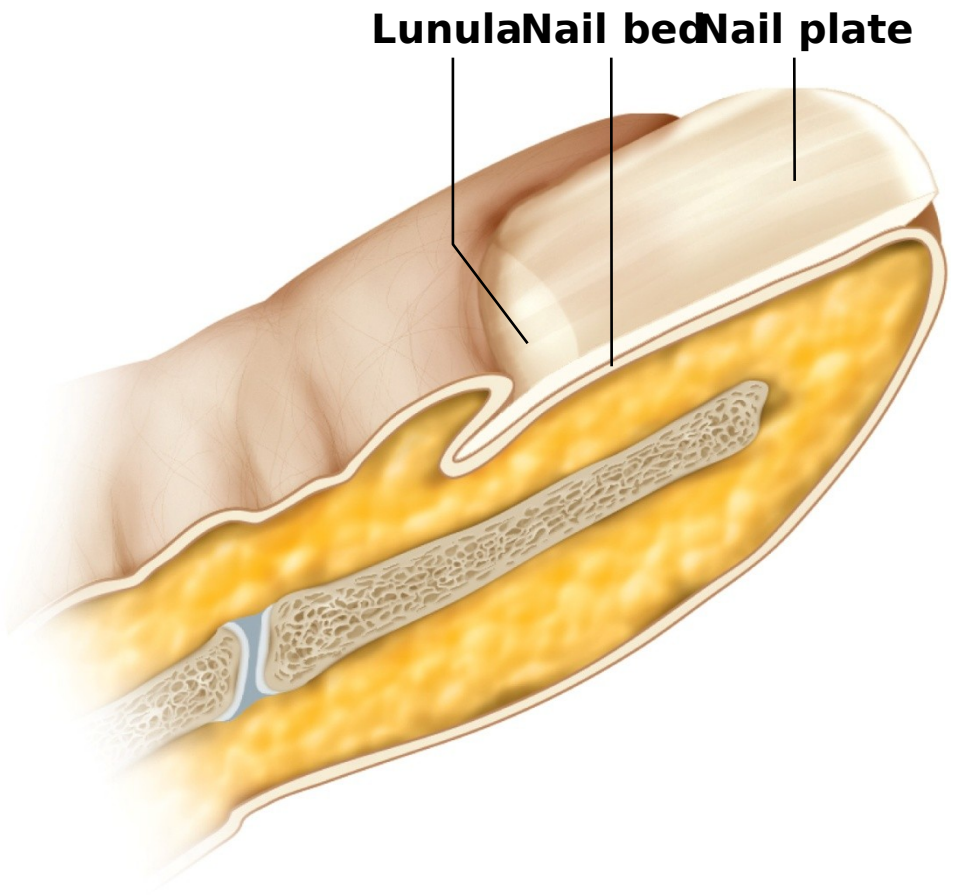

Sebaceous Glands

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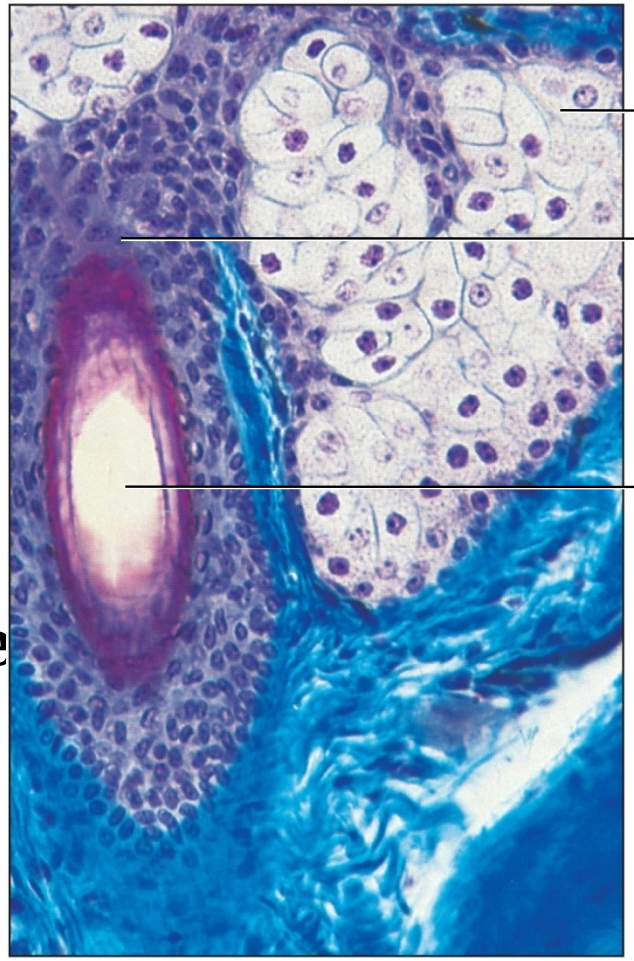
- Usually associated with hair follicles
- Holocrine glands
- Secrete sebum (oil)
- Absent on palms and sole



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Sweat Glands

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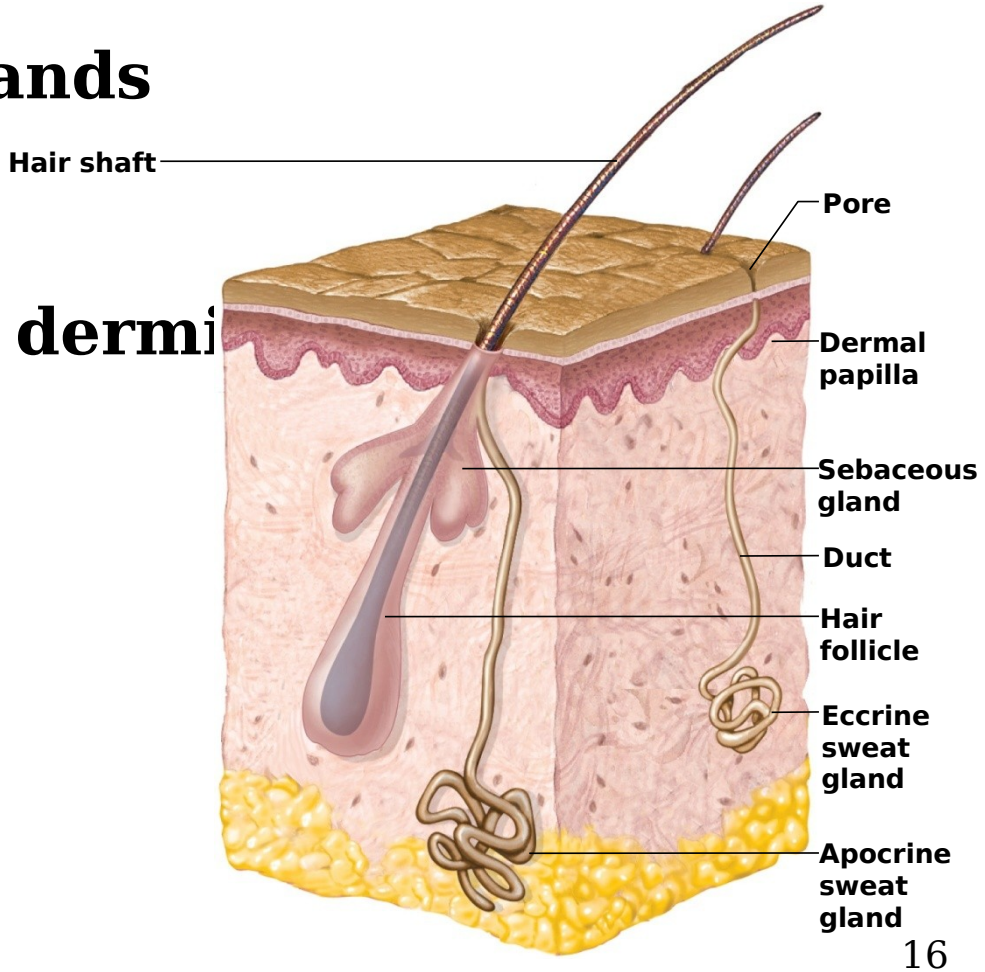
- Aka sudoriferous glands
- Widespread in skin
- Originates in deeper dermi
or hypodermis
- Eccrine glands
- Apocrine glands
- Ceruminous glands
- Mammary glands



6.4: Regulation of Body Temperature

- Regulation of body temperature is vitally important because even slight shifts can disrupt metabolic reactions.

Regulation of Body Temperature

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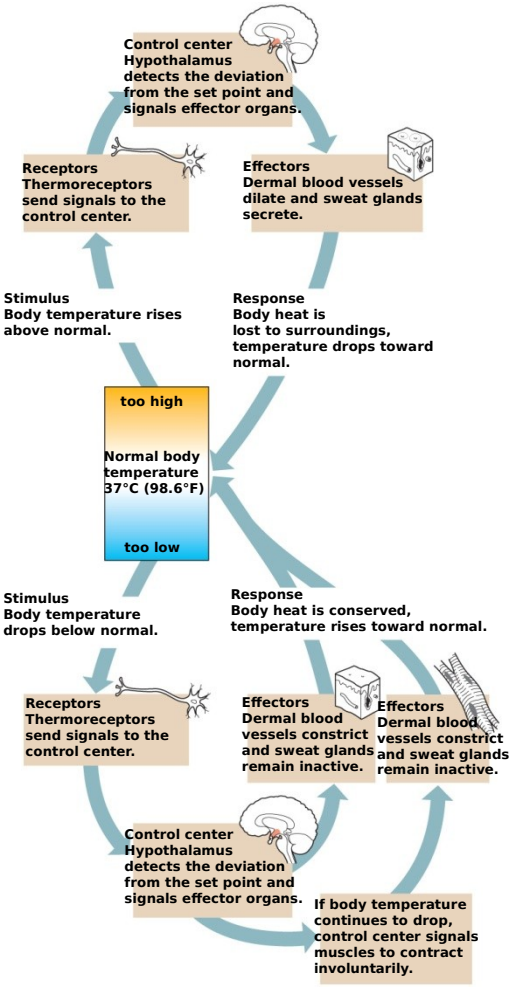

Heat Production and Loss

- Heat is a product of cellular metabolism
  - The most active body cells are the heat producers and include:
    - Skeletal muscle
    - Cardiac muscle
    - Cells of certain glands such as the liver
- The primary means of heat loss is radiation
  - Also there is conduction, convection and evaporation

Problems in Temperature Regulation

Hyperthermia – abnormally high body temperature

Hypothermia – abnormally low body temperature

6.5: Healing of Wounds and Burns

- Inflammation is a normal response to injury or stress.
- Blood vessels in affected tissues dilate and become more permeable, allowing fluids to leak into the damaged tissues.
- Inflammed skin may become:
  - Reddened
  - Swollen
  - Warm
  - Painful

Healing of Cuts

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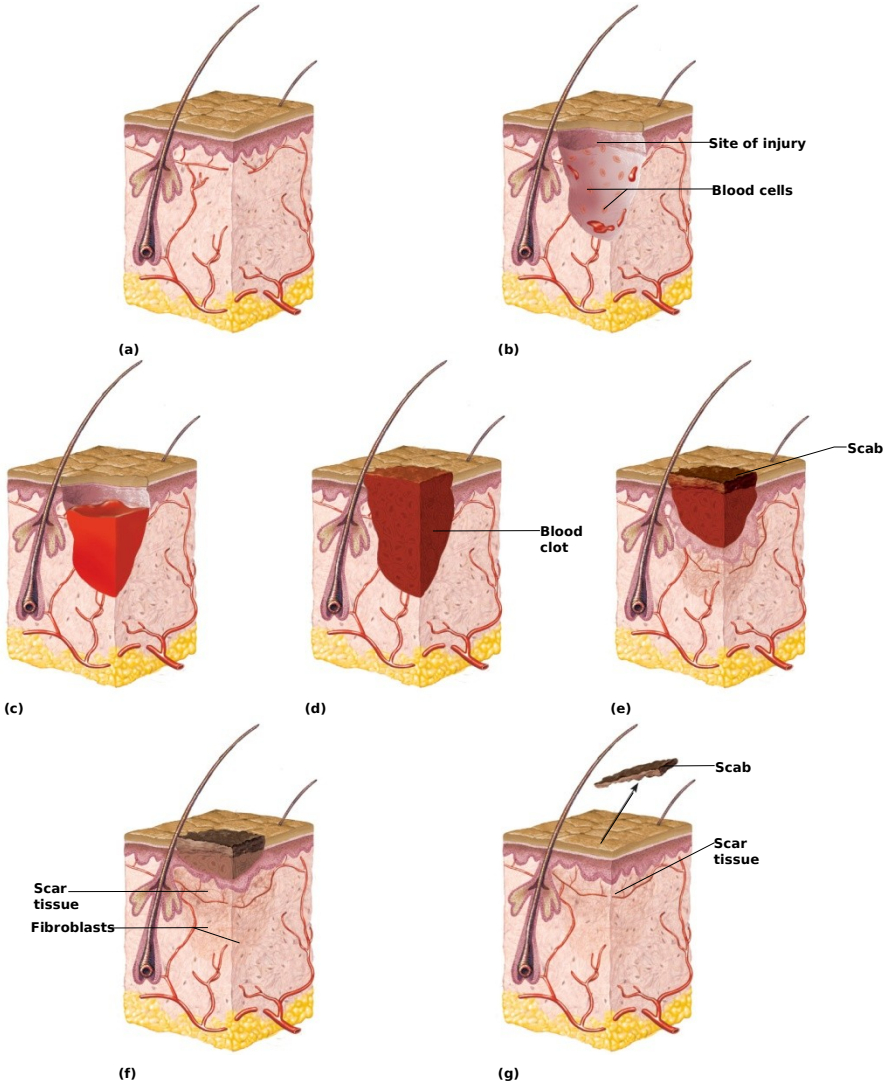

Types of Burns

First degree burn – superficial, partial-thickness

Second degree burn – deep, partial-thickness

- **Third degree burn – full-thickness**
  - **Autograft**
  - **Homograft**
  - **Various skin substitutes**

Rule of Nines for Adults

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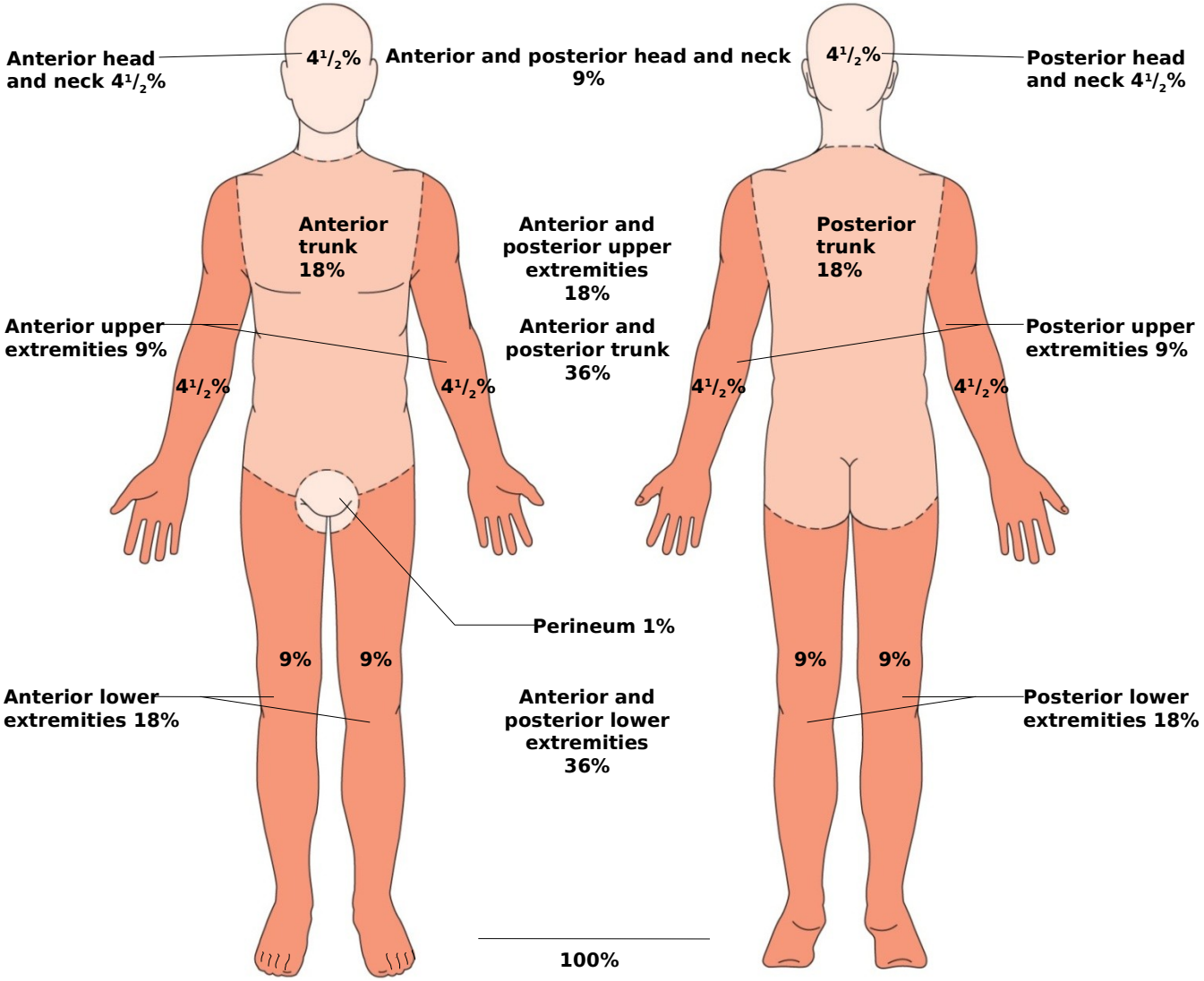
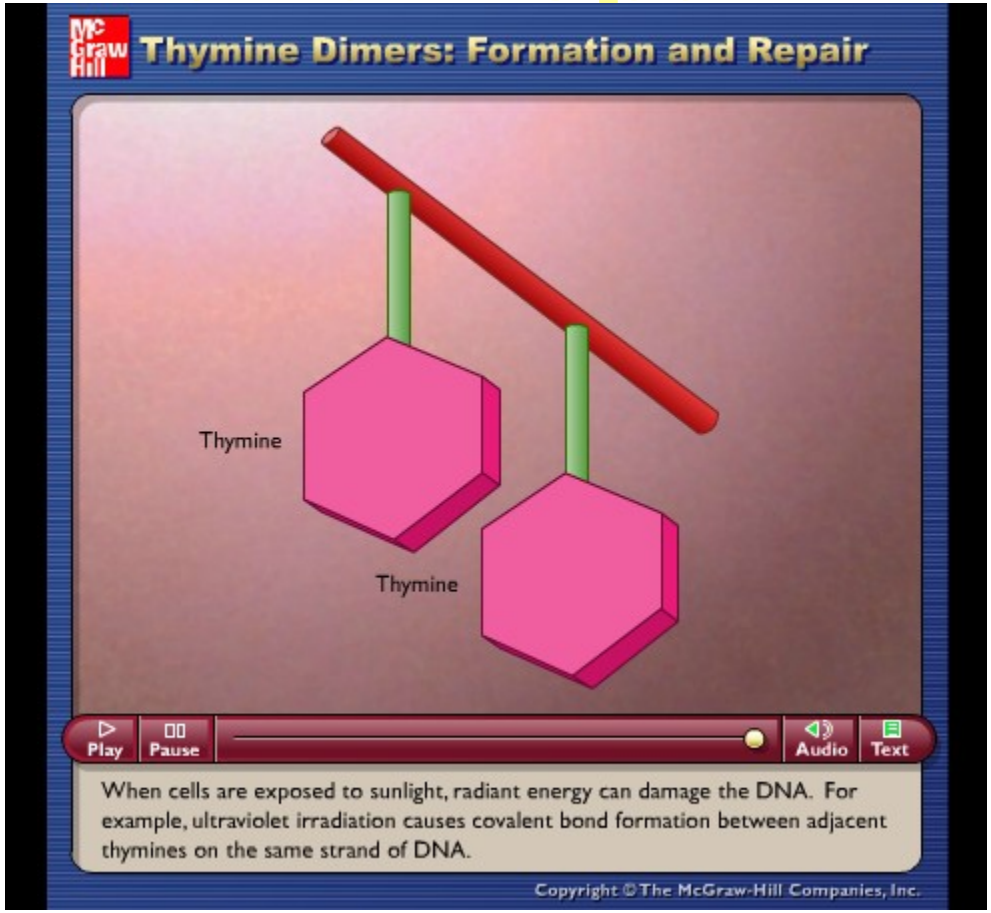


Animation: Thymine Dimers Formation and Repair


Thymine Dimers: Formation and Repair
Thymine
Thymine
Play
Pause
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When cells are exposed to sunlight, radiant energy can damage the DNA. For example, ultraviolet irradiation causes covalent bond formation between adjacent thymines on the same strand of DNA.
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6.6: Lifespan Changes

- **Skin becomes scaly**
- **Age spots appear**
- **Epidermis thins**
- **Dermis becomes reduced**
- **Loss of fat**
- **Wrinkling**
- **Sagging**
- **Sebaceous glands secrete less oil**
- **Melanin production slows**
- **Hair thins**
- **Number of hair follicles decreases**
- **Nail growth becomes impaired**
- **Sensory receptors decline**
- **Body temperature unable to be controlled**
- **Diminished ability to activate Vitamin D**